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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference AH:MC:FP19398	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/AU2004/000398	International filing date *(day/month/year)* 29 March 2004	Priority date *(day/month/year)* 28 March 2003
International Patent Classification (IPC) or national classification and IPC Int. Cl.[7] H01R 13/648, 13/629, H02G 15/117		
Applicant HEAD ELECTRICAL INTERNATIONAL PTY LTD et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of **3** sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. [X] *(sent to the applicant and to the International Bureau)* a total of **18** sheets, as follows:
      - [X] sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      - [ ] sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

   b. [ ] *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:
   - [X] Box No. I Basis of the report
   - [ ] Box No. II Priority
   - [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - [ ] Box No. IV Lack of unity of invention
   - [X] Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - [ ] Box No. VI Certain documents cited
   - [ ] Box No. VII Certain defects in the international application
   - [ ] Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of the report
16 September 2004	21 February 2005
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer **A. ALI** Telephone No. (02) 6283 2607

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/AU2004/000398

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1 (b))

☐ publication of the international application (under Rule 12.4)

☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

☐ the international application as originally filed/furnished

☒ the description:

pages as originally filed/furnished
pages* **1-12** received by this Authority on **3 February 2005** with the letter of **3 February 2005**
pages* received by this Authority on with the letter of

☒ the claims:

pages as originally filed/furnished
pages* as amended (together with any statement) under Article 19
pages* **13-18** received by this Authority on **3 February 2005** with the letter of **3 February 2005**
pages* received by this Authority on with the letter of

☒ the drawings:

pages **1/3-3/3** as originally filed/furnished
pages* received by this Authority on with the letter of
pages* received by this Authority on with the letter of

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages
☐ the claims, Nos.
☐ the drawings, sheets/figs
☐ the sequence listing (*specify*):
☐ any table(s) related to the sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages
☐ the claims, Nos.
☐ the drawings, sheets/figs
☐ the sequence listing (*specify*):
☐ any table(s) related to the sequence listing (*specify*):

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/AU2004/000398

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-24	**YES**
	Claims		**NO**
Inventive step (IS)	Claims	1-24	**YES**
	Claims		**NO**
Industrial applicability (IA)	Claims	1-24	**YES**
	Claims		**NO**

2. Citations and explanations (Rule 70.7)

Claims 1-24 meet the criteria under PCT Articles 33(2)-33(4) with regard to novelty, inventive step and industrial applicability.

The following documents cited in the International Search Report are the closest relevant art identified:

WO 1998/015037

AU 87239/01

The amended claims are distinguishable from the disclosure found in the above documents in that the electrical connection device comprises an insulating body and the core coupling means are earth-potential screened from one another so that a continuation of individual earth-connections to the suitable other electrical connection device is possible. This provides significant advantages for fault finding. If the earth potential layers are insulated from one another, it is possible to identify in which core or earth potential layer a fault is. Further, it would be possible to approximately determine where, for example along the machine cable, the fault is.

The above documents do not disclose those features. The claims are therefore novel, inventive and industrially applicable.

AN ELECTRICAL CONNECTION DEVICE

Field of the Invention

The present invention broadly relates to an electrical connection device for a machine cable. Throughout this specification the term "machine cable" is used for any machine, reeling or trailing cable that is suitable to deliver power to mobile machinery such as machinery in petroleum or mining industry. Further, throughout this specification the term "electrical device" has a meaning that includes an electrical connection device for a machine cable.

Background of the Invention

Machine cables are typically used to provide an electrical connection for mobile electrical machines. For example, in the mining or petroleum industry often large electrical machinery is used and each machine cable may have to provide power in the order of a few hundred kilowatts to a few megawatts. Typically such power is delivered with a voltage of one or more kilovolts. The cables usually comprise a plurality of cores and are connected using electrical connection devices including sockets, pins and thimbles.

The cores typically are insulated from each other and surrounded by a conductive layer that is on earth potential. Therefore, if the cores break, individual broken cores are less likely to be in electrical contact with each other, but instead are likely to be in electrical contact with respective layers that are on earth potential. Often automatic electrical earth leakage protection devices are used and in case of electrical contact between one of the cores and one or more layers

that are on earth potential, an automatic electrical earth leakage protection device will detect an earth leakage current in the order of 30 mA and subsequently interrupt the supply of electricity. Therefore, melt-down of the cable, electrical arcing and the like can largely be avoided. However, within a plug/coupling connection (electrical device) individual cores typically are not surrounded by individual layers on earth potential but are stripped off the layer and are surrounded by a common electrical casing that is on earth potential. Therefore, if individual cores are disrupted within the plug, it is more likely that the disrupted cores are in direct electrical contact with each other with fault current capacities of 10 kA to 50 kA. This will have dangerous consequences especially in an environment that may contain explosive gases such as a mine.

Summary of the Invention

The present invention provides in a first aspect an electrical connection device for connecting a multi-core machine cable to a suitable other electrical device, the multi-core machine cable being of the type having insulated cores individually surrounded by earth-potential layers, the device comprising:

an insulating body,

a plurality of insulating sleeves extending into the body,

a plurality of core coupling means each being at least in part positioned in a respective insulating sleeve, each core coupling means being connectable to a respective core of the machine cable and having a first contact surface for connecting to a terminal of the suitable other electrical device so as to provide

electrical connections of the machine cable with the suitable other electrical device,

a plurality of spaced apart earth coupling means surrounding at least a portion of respective insulating sleeves, each earth coupling means being connectable to a respective earth-potential layer of the machine cable and having a second contact surface for connecting to an earth potential terminal of the suitable other electrical device,

wherein the core coupling means are earth-potential screened from one another so that a continuation of individual earth-connections to the suitable other electrical connection device is possible.

Each core coupling means typically is, in use, surrounded by a respective insulating sleeve and by a respective conductive layer.

Each insulating sleeve typically is surrounded along its length by a respective earth-potential coupling means which typically comprises a conductive layer which is positioned in the insulating body, arranged for connection to a respective earth potential layer of the machine cable and spaced apart from another conductive layer of another earth coupling means. In this case, within the body of the electrical connection device, each core and the respective connection device is surrounded by an individual conductive layer that has, in use, earth potential and individual earth connections are typically completely continued through the device. If cores break within the body, dangerous short circuits are less likely to occur as the cores of the broken bunches are likely to contact the conductive layers that have earth potential rather than each other. An automatic electrical protection system,

such as an earth leakage system, can then be utilised to interrupt the supply of electricity and the danger of melting of cable insulation, electrical arcing and the like which in an environment that may contain explosive gases such as a mine may result in an explosion, therefore is reduced.

The electrical connection device typically is suitable for delivery of a power of more than 100kW or even more than 1MW.

The core coupling means may comprise a socket. Alternatively, the core coupling means may comprise a pin.

Each individual earth coupling means may have a ring-like contact which comprises the second contact surface and which may be positioned at or within the apertures.

The insulating sleeves typically are provided in form of tubes that may have threads at one end. The ring-like contacts typically are provided in form of nuts that are receivable by the threads of the insulating tubes.

A continuous earth-connection to a suitable other electrical device is possible by face-to-face connection to the suitable other electrical device. In contrast to prior art devices, which require to be dismantled for testing to separate individual earth potential layers from one another, technical testing procedures of the multi-core machine cable connected to the electrical connection device, such as testing of the earth potential layers, is possible in a simplified manner as the earth potential layers are electrically separated.

As the body is insulating and the earth connection means are spaced apart from one another, a continuation of individual earth-connections to a suitable other device is possible by connecting each nut to a respective earth

potential layer of the other electrical device. For example, the core coupling means of the electrical connection device may comprise pins and the first portion of the other electrical device may comprise sockets. The suitable other device may comprise ring-like contacts that are electrically connected to respective earth potential layers of the other device. In this case continuous individual earth connections can be established by face-to-face connection of respective ring-like contacts.

For example, the nuts may have an electrical conductive surface on their thread which may be arranged to contact a respective conductive layer. Each nut may also be composed of an electrically conductive material.

In one form, each insulating sleeve is arranged so that, in addition to the pin or socket that is positioned within the sleeve and when the electrical connection device is connected to the suitable other electrical device, a socket or pin, respectively, of the suitable other device is positioned within the insulating sleeve.

In one embodiment of the invention the multi-core machine cable is a three-core machine cable such as a three-phase cable. In this case the electrical connection device typically comprises three apertures and three insulating tubes associated with the apertures.

For example, the body may be composed of polymeric material.

Optionally, each insulating sleeve may be surrounded by a plurality of conductive layer which are electrically isolated so that, in use, a plurality of separate earth potential screens may be established.

The present invention provides in a second aspect an electrical connection device for connection to a suitable other electrical device the device comprising:

a multi-core machine cable of the type having insulated cores individually surrounded by earth-potential layers,

an insulating body,

a plurality of insulating sleeves extending into the body,

a plurality of core coupling means each being at least in part positioned in a respective insulating sleeve, each core coupling means being connected to a respective core of the machine cable and having a first contact surface for connecting to a terminal of the suitable other electrical device so as to provide electrical connections of the machine cable with the suitable other electrical device,

a plurality of spaced apart earth coupling means surrounding at least a portion of respective insulating sleeves, each earth coupling means being connected to a respective earth-potential layer of the machine cable such that, within the body, each core and the respective core coupling means are surrounded by a respective conductive layer or by the earth potential layer of the respective core, the earth coupling means having a second contact surface for connecting to an earth potential terminal of the suitable other electrical device so that within the electrical connection device the core coupling means are earth-potential screened from one another.

The present invention provides in a third aspect a system comprising:

at least one of the above-defined electrical connection devices,

at least one multi-core machine cable being of the type having insulated cores individually surrounded by earth-potential layers and

at least one electrical machine,

wherein the system is arranged so that electricity is delivered through the or each machine cable and through the or each electrical connection device and wherein the electricity associated with each core is individually earth-potential screened in the multi-core cable and in the or each electrical connection device.

Specific embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings.

Brief Description of the Drawings

Figure 1 shows a schematic cross-sectional representation of a portion of an electrical connection device according to a specific embodiment of the invention,

Figure 2 shows a schematic cross-sectional representation of a portion of an electrical connection device according to another specific embodiment of the invention,

Figure 3 shows a view of an end-face of the electrical connection device shown in Figure 1 or 2,

Figure 4 shows a schematic cross-sectional representation of a portion of an electrical connection device according to another specific embodiment of the invention and

Figure 5 shows a schematic cross-sectional

representation of a portion of an electrical connection device according to a further specific embodiment of the invention.

Detailed Description of Specific Embodiments of the Invention

Referring to Figures 1 to 3, the electrical connection device 10 is now described. Figure 2 shows a variation of the device that is in part shown in Figure 1. For clarity, however, the same reference numerals have been used in Figures 1 - 4 for parts that have the same function.

In this embodiment components of the electrical connection device 10 are sized and structured so that the electrical connection device is suitable for delivery of a few hundred kW to a few MW of power.

The device 10 comprises a body 12 that is composed of an insulating material such as a polymeric material. The body 12 is of substantially cylindrical shape and is surrounded by an outer shell 11 composed of a metallic material. Alternatively, the outer shell 11 may be composed of an insulating material such as a polymeric material. The body 12 and the outer shell 11 are typically fabricated so that they form one joined part. If the outer shell is composed of an insulating material, the body 12 and the outer shell 11 may also be integrally formed.

Figures 1 and 2 show representative portions of the device 10. The body 12 and the outer shell 11 have an end-face 14 that has three apertures (see Figure 3) at which nuts 16, 18 and 20 are positioned. From each aperture an insulating sleeve 22 projects inwardly. Each insulating sleeve 22 has a threaded end-portion 23 that is arranged to receive respective nuts 16, 18 or 20. Each insulating

sleeve 22 is surrounded by a conductive layer 24 and locates a pin 26. The pin 26 is connected to a thimble 28 which is connected to an individual core 29 of a multi-core machine cable (the multi-core machine cable is not shown).

In this embodiment the multi-core machine cable is a 3-phase cable having three multi-strand cores. Each core is insulated and has an earth-potential layer 31 individually surrounding its insulation 29a.

The earth-potential layer 31 is in contact with cold-shrink tube 32. The cold-shrink tube 32 surrounds a portion of the earth layer 31 and also a portion of the conductive layer 24 of the insulating sleeve 22. In general cold-shrink tubes are used to provide electrical insulation and the inhibit penetration of moisture. The cold-shrink tube 32 also has a conductive layer on its interior surface which establishes an electrical connection between the earth-potential layer 31 and the conductive layer 24. The cold-shrink tube 32 is in part surrounded by a further cold-shrink glove 33 which is arranged to reduce the likelihood that moisture from the machine cable may penetrate into the electrical device 10. Cold-shrink tube 34 in part surrounds an end portion of sleeve 22 and is arranged to reduce the likelihood that moisture penetrates from the insulating sleeve 22 along core 29 into the machine cable and vice versa. Further, cold shrink tube 34 provides additional insulation between parts that are electrically connected to the core 29 and parts that are on earth potential such as the conductive layer of tube 32.

Thimble 28 is connected to a core 29 of the multi-core cable and the respective earth potential layer 31 is connected to the conductive layer 24. Therefore, the core

29 and any conductive portions that may be in electrical contact with the core are, is within the body 12 individually surrounded either by the conductive layer 24 or the respective earth potential layer 31 of the multi-core cable. The conductive layer 24 is connected to the nut 16 which is, in this example, metallic.

The end-face 14 of the external shell 11 is composed of an insulating material. Therefore, for each core of the machine cable an individual earth connection is established within the electrical connection device 10 and can be individually continued to another electrical device (not shown) via the faces of nuts 16, 18 and 20.

The electrical connection device 10 may be connected to the machine cable as follows. Initially a core 29 of the machine cable is connected to thimble 28. Thimble 28 and pin 26 are then inserted into sleeve 22 from opposing ends and are connected in sleeve 22 at an internal shoulder 39 so that the pin 26 and the thimble 28 are firmly mechanically connected with the sleeve 22. Cold-shrink tube 34 is then applied over an end-portion of sleeve 22 and over the insulation 29a of core 29. Cold-shrink tube 32 is applied over the earth-potential layer 31 of the core 29 and over the external shoulder of sleeve 22 so as to provide an electrical connection between the external conductive layer 24 of the sleeve 22 and the earth potential layer 31. Cold-shrink glove 33 is then applied over cold-shrink tube 32 and over the outer sheath of the multi-core cable (the multi-core cable is not shown). Sleeve 22 is inserted into an aperture of body 12 so that an external shoulder of sleeve 22 abuts against an end-face of body 12. Nut 16 is then inserted into the aperture from an opposing end-face 14 of body 12. After nut 16 is secured with sleeve 22, a mechanical connection

between sleeve 22 and body 12 is established.

Figure 4 shows a portion of the electrical connection device 10 connected to another electrical connection device 40. In this example the nut 16 is replaced by nut 16a which is composed mainly of an insulating material but has a metallic layer on its thread that is in contact with conductive layer 24 of sleeve 22. The other electrical connection device 40 comprises two sockets 51 which are electrically connected in an insulating body 54. The other electrical connection device 40 and the electrical connection device 10 are arranged so that one of the sockets 51, when connected to pin 26, is positioned within the insulating sleeve 22. Individual earth connections are established via conductive sleeve 56 which is positioned at least in part within insulating body 54. Thus, the individual earth layer 31 of the respective core of the machine cable (not shown) is connected via the conductive layer of the cold-shrink tube 32 (see Figure 1), the conductive layer 24 of the insulating sleeve 22 and the conductive thread of nut 16a with conductive layer 56. In this embodiment individual earth connections can be established even if, in a variation of this embodiment, the face 14 of the external shell were electrically conductive as the nuts 16a are composed of an insulating material and only have an inner conductive layer. The other electrical connection device 40 may receive a further electrical connection device of the same type as electrical connection device 10 and the assembly of the devices therefore would provide an electrical connection between two multi-core machine cables in which individual earth potential layers are continued individually (via earth layers 31, earth layers 24, nuts 16a and conductive sleeve 56).

Figure 5 shows another embodiment of the present invention. The Figure shows a coupling device 60 that comprises two electrically connected sockets 61 and an insulating sleeve 63. Three of the devices 60 may be used to electrically connect two devices 10 shown in Figures 1 - 3. Each of the devices 60 is, in this case, arranged to fit into respective apertures defined by nuts 16, 18 and 20. If two devices 10 of the type shown in Figures 1-3 are connected using three devices 60 and the two devices 10 have electrically insulating faces 14 of the outer shells 11, continuous and individual earth connections may be established by face-to-face connection of the nuts 16,18 and 20 of the respective devices 10.

Although the invention has been described with reference to particular examples, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms. For example, the pin 26 may only partially be positioned within the insulating sleeve 22 and it may extend through the aperture of the nut 16. Also, the insulating sleeve 22 may have a socket 51 positioned within its interior instead of the pin 26. Optionally, one sleeve may have a pin and another sleeve may have a socket positioned within its interior. The electrical connection device 10 may be arranged for connection to any type of connection device including a lug or any other electrical device. It will also be appreciated that cold shrink tubes 32 and 34 and cold shrink glove 33 may be replaced by suitable insulating heat-shrink products or suitable insulating adhesive tape.

The Claims:

1. An electrical connection device for connecting a multi-core machine cable to a suitable other electrical device, the multi-core machine cable being of the type having insulated cores individually surrounded by earth-potential layers, the device comprising:

an insulating body,

a plurality of insulating sleeves extending into the body,

a plurality of core coupling means each being at least in part positioned in a respective insulating sleeve, each core coupling means being connectable to a respective core of the machine cable and having a first contact surface for connecting to a terminal of the suitable other electrical device so as to provide electrical connections of the machine cable with the suitable other electrical device,

a plurality of spaced apart earth coupling means surrounding at least a portion of respective insulating sleeves, each earth coupling means being connectable to a respective earth-potential layer of the machine cable and having a second contact surface for connecting to an earth potential terminal of the suitable other electrical device,

wherein the core coupling means are earth-potential screened from one another so that a continuation of individual earth-connections to the suitable other electrical connection device is possible.

2. The electrical connection device as claimed in claim 1 wherein each core coupling means is surrounded by a respective insulating sleeve which is surrounded along its

length by a respective earth-potential coupling means which typically comprises a conductive layer.

3. The electrical connection device as claimed in claim 1 or 2 arranged such that, within the body, each core and the respective core coupling means are, in use, surrounded by a respective conductive layer or by the earth potential layer of the respective core.

4. The electrical connection device as claimed in any one of the preceding claims wherein each insulating sleeve is surrounded along its length by a respective conductive layer.

5. The electrical connection device as claimed in any one of the preceding claims wherein the core coupling means comprises a pin.

6. The electrical connection device as claimed in any one of claims 1 to 4 wherein the core coupling means comprises a socket.

7. The electrical connection device as claimed in any one of the preceding claims having ring-like contacts which comprise the second contact surfaces, each ring-like contact being positioned at a respective one of the apertures and electrically contactable with respective ones of individual conductive layers which the earth coupling means comprises.

8. The electrical connection device as claimed in any one of claims 1 to 6 having ring-like contacts which comprise the second contact surface, each ring-like

contact being positioned within a respective one of the apertures and electrically contactable with respective ones of the individual conductive layers.

9. The electrical connection device as claimed in any one of the preceding claims wherein the insulating sleeves are provided in form of tubes.

10. The electrical connection device as claimed in claim 9 wherein each tube has a thread at one end.

11. The electrical connection device as claimed in claim 10 when dependent on claim 7 or 8 wherein the ring-like contacts are provided in form of nuts that are receivable by the threads of the insulating tubes.

12. The electrical connection device as claimed in claim 11 wherein, in use, each conductive layer is in electrical contact with a respective nut.

13. The electrical connection device as claimed in claim 12 wherein each nut has an electrical conductive surface on its thread.

14. The electrical connection device as claimed in claim 13 wherein each nut is composed of an electrically conductive material

15. The electrical connection device as claimed in any one of the preceding claims arranged such that, when the electrical connection device is connected to the suitable other electrical device, a coupling means of the suitable other electrical device is positioned at least in part

within a respective one of the insulating sleeves of the electrical connection device.

16. The electrical connection device as claimed in any one of the preceding claims wherein the multi-core machine cable is a three-core machine cable and the electrical connection device comprises three apertures and three insulating tubes associated with the apertures.

17. The electrical connection device as claimed in any one of the preceding claims wherein the device comprises an exterior surface portion that is metallic.

18. The electrical connection device as claimed in any one of the preceding claims wherein the device comprises an exterior surface portion that is electrically insulating.

19. The electrical connection device as claimed in claims 18 wherein the body is composed of a polymeric material.

20. The electrical connection device as claimed in any one of the preceding claims wherein each insulating sleeve is surrounded by a plurality of conductive layer which are electrically isolated so that, in use, a plurality of separate earth potential screens is established.

21. The electrical connection device as claimed in any one of the preceding claims being suitable for delivery of more than 100 kW of power.

22. The electrical connection device as claimed in any one of the preceding claims being suitable for delivery of more than 1 MW of power.

23. An electrical connection device for connection to a suitable other electrical device the device comprising:

a multi-core machine cable of the type having insulated cores individually surrounded by earth-potential layers,

an insulating body,

a plurality of insulating sleeves extending into the body,

a plurality of core coupling means each being at least in part positioned in a respective insulating sleeve, each core coupling means being connected to a respective core of the machine cable and having a first contact surface for connecting to a terminal of the suitable other electrical device so as to provide electrical connections of the machine cable with the suitable other electrical device,

a plurality of spaced apart earth coupling means surrounding respective insulating sleeves, each earth coupling means being connected to a respective earth-potential layer of the machine cable such that, within the body, each core and the respective core coupling means are surrounded by a respective conductive layer or by the earth potential layer of the respective core, the earth coupling means having a second contact surface for connecting to an earth potential terminal of the suitable other electrical device

wherein the core coupling means are earth-potential screened from one another so that a continuation of

individual earth-connections to the suitable other electrical connection device is possible.

24. A system comprising:

at least one electrical connection devices as claimed in any one of claims 1 to 22,

at least one multi-core machine cable being of the type having insulated cores individually surrounded by earth-potential layers and

at least one electrical machine,

wherein the system is arranged so that electricity is delivered through the or each machine cable and through the or each electrical connection device and wherein the electricity associated with each core is individually earth-potential screened in the multi-core cable and in the or each electrical connection device.